

Exploring Mekong Futures for Laos

Exploring the impacts of large-scale irrigation on poverty reduction and alternative development scenarios in the Nam Ngum catchment, Lao PDR.



The issue

Lao PDR is one of the world's least developed countries. The Nam Ngum River supports one of the country's largest food production areas and the largest irrigated area in Lao PDR. It contributes 14% to the Mekong River's flow.

Environmental flow from the Nam Ngum into the Mekong is critical for downstream users and ecosystems, particularly in the dry season. Cooperation among water users within the basin is important as the Nam Ngum is used for a wide variety of purposes such as hydropower, irrigation, mining and ecotourism as well as providing a source of fish for diet and income to more than 500,000 basin inhabitants. Authorities plan to increase the number of dams in the upper catchment from four to 14 to produce urgently needed electricity and to provide irrigation water in an attempt to reduce poverty. This will modify the seasonal flow of the river, impacting the availability of water for irrigation. The river basin organisation asked the project team to assess water availability to support current and future irrigated agriculture demand.

Our approach

Concentrating on the Nam Ngum catchment, this study was designed to explore key decisions around water related property rights and water futures, highlighting trade-offs between alternative water uses such as irrigation needs, hydropower development, industry and services sector needs. The project explored the impacts of large-scale irrigation on poverty reduction and worked with local groups to investigate alternative development scenarios.

The project was managed as a partnership between CSIRO, in collaboration with International Water Management Institute (IWMI) and the Lao Ministry of Natural Resources and the Environment (MoNRE) from 2010-2014.



Key lessons for development

- Whilst large-scale irrigation schemes can reduce poverty in the basin by enhancing food production, greater poverty alleviation can be achieved through the promotion of a diverse regional investment portfolio
- People who live below the poverty line and don't own land (i.e. the most marginal) receive only marginal benefit from investment in large scale irrigation. Greater poverty alleviation can be achieved through the promotion of a diverse regional investment portfolio.
- Well-designed participatory planning processes that are underpinned by science can lead to a change in beliefs by actors and encourages consideration of more diverse/appropriate/nuanced solutions to complex development challenges.

DFAT-CSIRO Research for Development Alliance

This project was funded by the Research for Development Alliance, a strategic partnership tackling complex development challenges in the Asia Pacific region.

Project partners

CSIRO, the International Water Management Institute (IWMI), Lao Ministry of Natural resources and the Environment (MoNRE) and the Australian Department of Foreign Affairs and Trade (DFAT).

Key achievements

OUR STORY

What did the project deliver?

Assessment of the impact of hydropower dams on irrigated agriculture was carried out by project partner IWMI, which showed that even during very dry years, there is sufficient water to supply the agricultural sector, which is the largest water user in the basin. The study showed that under a scenario of significant (but unlikely) irrigation development water demand could exceed supply.

Participatory Planning Approaches were introduced. The Mekong Futures project introduced a participatory learning process designed to identify a range of development options, beyond the status quo. The CHARL approach (Challenge and Reconstruct Learning approach) challenges current thinking by introducing alternative development scenarios and scientific evidence (including climate change projections), taking stakeholders through a more deliberative and engaging process to consider future development options.

Scenario planning was undertaken in the project looking at the potential impact of large irrigated infrastructure development on alleviating poverty. The results demonstrated that providing irrigation only, helps people who own land. People who live below the poverty line and who don't own land benefit much less from investment in irrigation – these are often the most marginal groups in the community and the specific target of poverty alleviation strategies. The findings challenged current beliefs, and posed alternative development scenarios that could deliver greater benefit to poor rural communities by opening up development planning to a more diverse range of investments.

How is it being used?

The IWMI assessment was incorporated into the wider project modelling and scenario planning analysis, which showed that despite expectations to the contrary, large-scale irrigation schemes are less likely to generate a widespread positive impact on poverty in the basin compared to a more diverse suite of smaller scale investments.

The participatory process targeted an improved decision makers' understanding of the likely, unforeseen impacts of impending development strategies in the Mekong region. Prior to the project workshop process most decision-makers indicated that in their view large-scale irrigation was the preferred solution for poverty alleviation. This belief changed during the course of the project. In the final workshops most participants agreed that smaller-farm scale solutions would have a greater net benefit on poverty reduction in the region.

The scenario planning information is being used to inform Nam Ngum development plans. Follow on activity has now been requested for Nam Xong Sub River Basin.

What impact did the project have?

The project was the first of its kind to conceptualise the complexity of water-food-energy trade-off decisions in the Mekong context, with a focus on development outcomes for Laos.

The project's work has contributed to the basin development plan in the Nam Ngum River basin and is contributing to planning processes for the country's other river basin organisations.

Following the project's assessment of development in the Nam Ngum catchment, the leader of the Nam Ngum River Basin Committee, Mr Chanthanet – now Director General in the Ministry of Natural Resources and Environment – was impressed at how the project created an evidence based planning system and sought funding to train the Nam Ngum River Basin Committee in the CSIRO planning approach (known as the ChaRL protocol).

The Nam Ngum River Basin Organization took this insight on board and irrigation investment is now considered on a more case by-case basis, with a focus on districts where poverty is likely to be reduced.

Elsewhere, alternative strategies will be implemented, in particular the creation of employment opportunities in manufacturing and food processing. The Lao National Assembly has also adopted the project's recommendation to revise a suite of its draft investment proposals – which are largely based on large-scale irrigation.

Impact Pathway

The project aimed to influence beliefs about water options in the Nam Ngum catchment, highlighting trade-offs between alternative water uses, through the deliberative consideration of scientific evidence. To achieve this, the research team developed an Impact Pathway consisting of three linked phases (Fig. 1a). Phase 1 focused on ‘capacity building’. This enabled the allocation of resources and the development of plans, agreements and new projects through Phase 2 ‘policy and program development’. Following on from Phase 2, Phase 3 involved ‘implementation, adoption and scaling out’. These phases would cumulatively build the adaptive capacity of the project stakeholders. However, while Phase 1 encompassed the project’s activities (solid line), Phases 2 and 3 were out of the project team’s direct control (dashed line). Consequently, the Impact Pathway was clear for Phase 1, but less so for Phases 2 and 3.

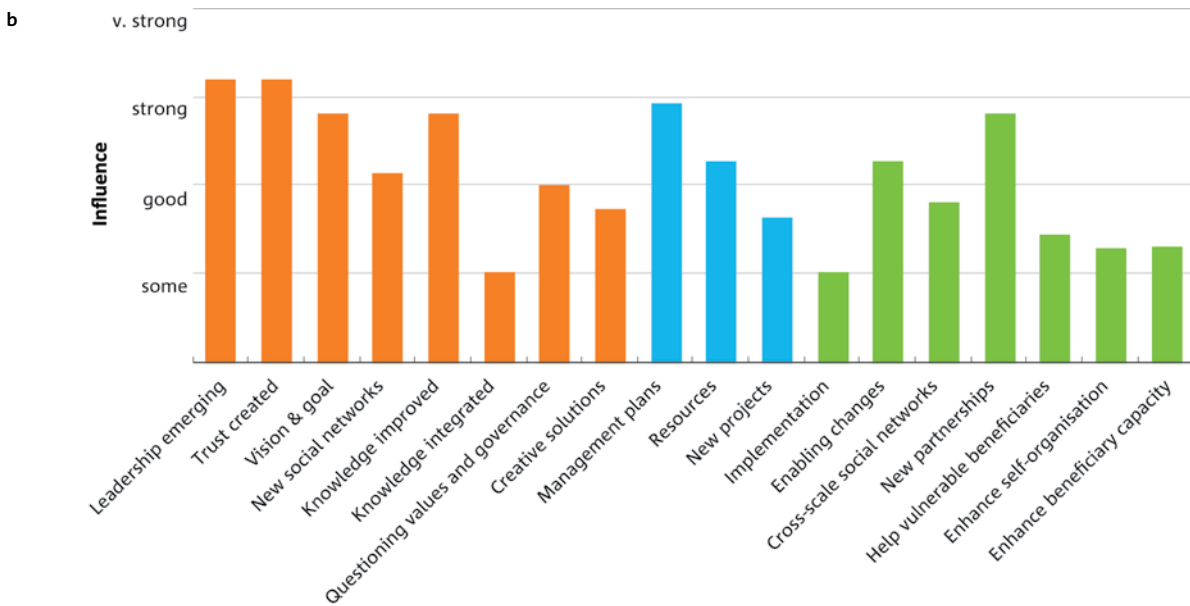
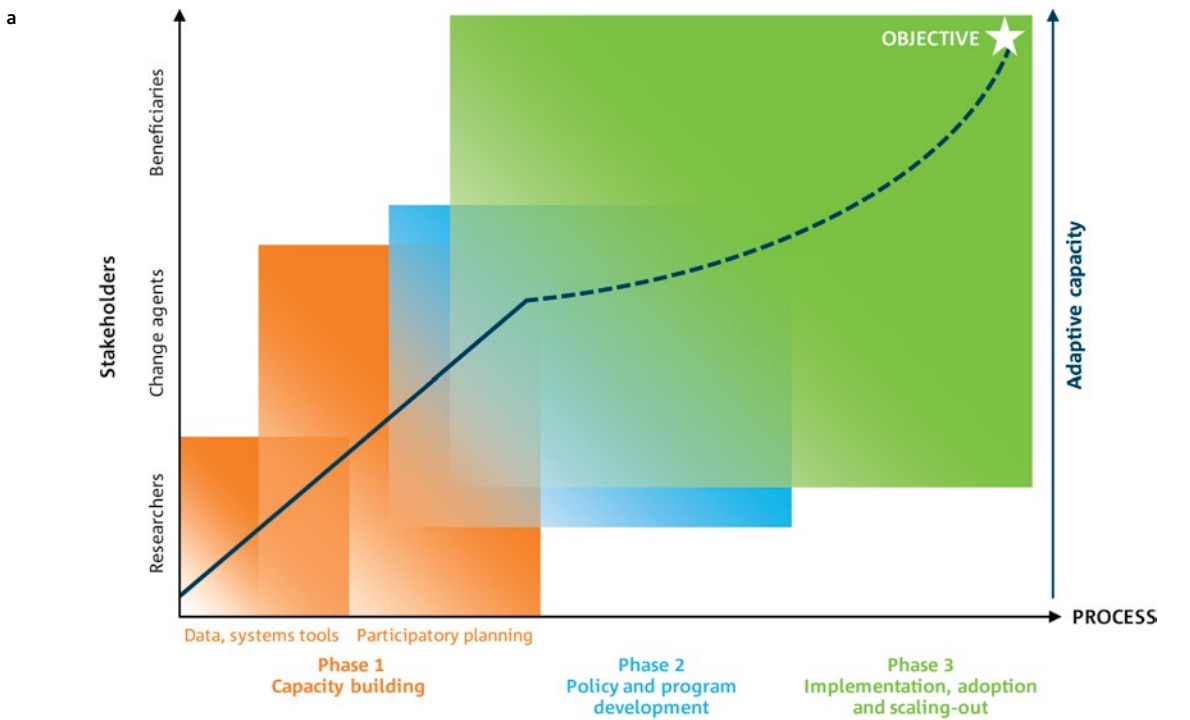


Figure 1. The project’s (a) Impact Pathway and (b) influence on adaptive capacity within the Impact Pathway’s three phases based upon the 18 indicators, colour coded as in part a

Evaluating impact

To track the influence of the project on stakeholders' adaptive capacity, and to enable comparisons between all Alliance projects, a standardised set of 18 indicators was developed. According to the project's Impact Pathway, each phase encompassed a progressively wider group of stakeholders, and the indicators were designed to assess change amongst them. Fifteen researchers and change agents involved in Phase 1 were interviewed at project completion and asked to provide their assessment of change by scoring each indicator, offering evidence for their scores. Results showed that there had been a positive influence for all indicators in all phases (Fig. 1b).

PHASE 1: Building capacity had the highest-scoring indicators, which was to be expected since this was a core focus of the project's activities. The project had a strong emphasis on leadership and trust, with participants noting their own leadership and capacity to implement programs and activities had been improved as a result of the project workshops. Cooperation had also been enhanced between participants, both within the water sector and between other sectors, such as provincial government, central agencies and districts.

Participants felt the process undertaken during the project had led to a common goal and vision of a sustainable use of the Nam Ngum River Basin, but that challenges remained around the development of more practical implementation measures. Knowledge and information about water resources was exchanged, and existing values were questioned particularly at the district and village levels. 'Knowledge' challenges included a lack of data (due to funding constraints) and a culture of limited sharing of information amongst all stakeholders with lesser knowledge base and lower technical ability such as villagers. In spite of these challenges participants felt that their knowledge of water resources in Nam Ngum had improved, with concrete examples and a common understanding developed.

Participants identified a lack of resources and tools as a key barrier to integration and this indicator was scored lowest. Positively, this encouraged the development of creative solutions to the region's resource management and development challenges.

PHASE 2: Policy and program development had a slightly weaker set of indicator scores compared to Phase 1. Project stakeholders indicated that a number of water resource management plans had commenced in 2015, including an agreement with a district governor for a sector implementation plan; and this indicator was scored strongly. Some provinces and districts have provided staff to better enable coordination and implementation of new management plans, however, limited financial resources and insufficient expertise were identified as key barriers to further progress in the near term. Positively, some villages have volunteered to act as 'on the ground' water and environment resource networks.

The project had a limited budget for ongoing engagement with stakeholders. However stakeholders identified that a number of related follow on projects have been implemented as a result of the Mekong Future project's activity to investigate options for water management, water quality, sub-basin management, and a flood and drought survey has also been commissioned. The sub-basin planning and water quality activities are being undertaken in Nam Xong Sub River Basin, which is an IWRM demonstration site (in cooperation with DONRE and DWR, MONRE). With further water quality monitoring in Nam Lik, Nam Kho, Nam Ting-Nam Chat su-river basins. Flood management work is also underway in Nam Lik Sub River Basin, and water quality, drought management, and flood management in Nam Pik-Nam Souy sub river basin.

PHASE 3: Implementation, adoption and scaling-out had a mix of indicator scores, with strong enabling changes and new partnerships indicators and good, although weaker, scores for the other indicators. This could be explained by the scale that the project was targeted at, with researchers and senior government stakeholders rather than focusing on implementable actions for communities.

While participants noted that there has yet to be any organisational change, they highlighted that the knowledge generated through the project has changed their thinking and assisted them to apply it beyond current circumstances. In particular the scenario and planning activities for basin management have helped pave the way of solution oriented approaches. Local stakeholders indicated that village scale implementation and observation activities are now underway, with a lack of expertise and funding identified as the major limiting factor for more widespread activities.

All respondents indicated that water information was now better shared across agencies, with linkages being strengthened including with the private sector, although there is still room for improvement particularly due to the lack of information about water quality and quantity. Respondents highlighted that new partnerships had been created between government, private companies, communities and NGOs, with increasing interest from stakeholders.

Implementation was not within the scope of this project, and there was limited evidence to indicate substantially enhanced self-organisation and increased capacity in vulnerable communities at project completion. However, by providing communities with greater technical capacity, the project has increased their understanding and willingness to participate in ongoing learning activities. This is an important step towards impact.

Benefit Cost Analysis of potential future large-scale irrigation infrastructure investment compared to alternative aid investments

Benefit Cost Analysis (BCA) provides an additional approach to evaluation. It allows quantification of monetary benefits relative to funding invested.

In a **baseline scenario** we estimated costs and benefits of an irrigation infrastructure investment in the Nam Ngum tributary to the Mekong in Lao PDR where proposals have been put forward to develop irrigation as an additional benefit from the Nam Ngum hydropower dam. Here an annual total Lao and foreign investment of \$100 million represents required capital investment and 30 year operation and maintenance (O&M) cost for developing a 9049 hectare irrigation command area.

One key conclusion from this analysis is that it is unlikely that benefits from large irrigation infrastructure would exceed costs. A combination of high future prices and rice yield growth could lead to positive net returns. Other than very high commodity prices, positive net returns cannot be expected with any single high or low value for any one uncertain parameter (holding all other parameters at the median).

The **small-scale pump irrigation scenario** evaluates the investment in small-scale pump based irrigation at a scale required to irrigate the equivalent of 5500 hectares – representing 60 percent of the 9094 hectares irrigation command area under large-scale irrigation investments to account for the fact that typically, only 60 percent of planned large-scale irrigation command area is actually utilised. The scenario included all costs required to operate and maintain this for 30 years to maintain consistency with the baseline scenario investment horizon. Specifically, developing small-scale irrigation would involve investing in farm scale pumps to access ground or surface water, wellhead and conveyance capital, plus power and other operating costs.

The BCA indicates that a positive net return would be expected from investments in farm-scale irrigation schemes. Results show a high probability of breaking even at worst and realising profits at best from this investment. Further, the results indicate that few combinations of uncertain parameter values would result in negative net returns.

The overall conclusion from comparison between large- and farm-scale irrigation infrastructure investment scenarios is that on balance Lao PDR may benefit more substantially from policies and investments to encourage farm-scale pump irrigation than from augmentation of existing hydro-power dams with investments to convey water to large-scale irrigation command areas. A caveat to this conclusion is that very little is understood about the potential for expansion of farm-scale pumping irrigation.

The cost of the Nam Ngum EMRF research was AUD\$380,000. Surveys of the local government and international aid community participants carried out before and after project workshops revealed statistically significant changes from predominantly favouring to predominantly disfavouring of large-scale irrigation investment in favour of more diversified aid investments. The extent to which this translates to any future change in investment is unknown. Absent this information, all that is possible is a calculation of benefits and costs assuming a change in irrigation investment from the assumed baseline level of \$100 million per year. To this end, we estimated project net benefit and benefit-cost ratio for reallocating funding away from large scale irrigation investment towards a portfolio with equal thirds investment in roads, education, and agricultural research and development. Project net benefits and benefit-cost ratios ranging from conservative to generous attribution of research benefit were assessed by assuming changes from one year baseline Lao PDR irrigation investment between 0% and 100%. Table 1 details research net present values and benefit-cost ratios for the change in investment under various attribution assumptions. The net research benefit was calculated as the change in NPV for full reallocation of \$100 million from irrigation to the diversified portfolio multiplied by the attribution factor minus the cost of research (\$380,000). For example, at a 1% research attribution factor, the allocation of 1% of \$100 million (\$1 million) away from irrigation to a portfolio of education, roads and agricultural research and development results in a \$4.0M net benefit and a project benefit cost ratio of 11.6.

Table 1. Net research benefits (NB) and benefit-cost ratios (BCR) of the EMRF research estimated for alternate Nam Ngum investment strategies applied at 0%-100% attribution factors

INVESTMENT STRATEGY		ATTRIBUTION FACTOR					
		0%	1%	5%	10%	50%	100%
\$100 million reallocated from large-scale irrigation infrastructure investments to a portfolio of education, roads & agricultural R&D in equal thirds	NB (Au\$ million)	-0.38	4.0	21.6	43.5	219.2	438.8
	BCR	0	11.6	57.8	115.6	577.8	1155.7

Alliance wide lessons

Designing investments to assist vulnerable communities in developing countries adapt to global change (e.g. globalised markets, population growth and climate) is typically complex. This is particularly true for the Alliance where our portfolio of multi-year projects focused on global development challenges related to climate, water resources, sustainable cities, and food security. Each of the projects involved multiple actors (e.g. planning, emergency services, and primary industries) at multiple scales (local, provincial, national and global) and over time, reflecting the broad domain of R4D.

Our experience is that the context-specific nature of these investments is best served by a well-informed approach to project structure and design. Practical learning from these projects can support the development of guidance to improve aid investment outcomes. Key findings included:

- **Strong partnerships and collaboration lead to better outcomes:** Partnerships can be developed or evolve in a number of ways, all of which can be effective. Our projects included partnerships where we led, where we worked with our in-country partners to build demand, and those where we responded to demand. These partnerships were formed and evolved around relationships and purpose. A general observation is that ‘pull’ type projects appear to have the most clearly articulated impact pathway at the national policy level and provide the least scope for expansion; whereas co-developed or evolutionary type projects provide greater flexibility and also more opportunities to broaden partnerships over the life of projects, which can significantly improve impact. In all cases, it takes time to build appropriate, effective communication processes and trust; especially when there are cultural and institutional differences. This can be expedited through ongoing in-country presence and two-way exchanges of personnel, which provides high strategic value but carries a high operational cost.
- **Capacity building and engagement:** Engagement early on (i.e. pre-project) provides a valuable platform for co-development of projects that are then shaped by and can be responsive to local context. This has the added value of building trust between partners, which can be increased over time through capacity building initiatives. Traditional develop-deliver skillsets such as two-way mentoring, use of trusted advisors and local champions to facilitate engagement, improved project management and engagement skills, remain important; however, our experience is that conjointly developed knowledge, products and services are more context-specific and tractable.
- **Participatory approaches:** Partner institutions have high levels of connectedness with government institutions and other boundary partners – giving the research a stronger pathway to impact and increasing its relevance. Participatory approaches can improve the status of research partners and encourage buy-in from key decision-makers, which is important for longer-term support. Participatory planning approaches also strengthen formal and informal networks amongst decision-maker communities and between decision-makers and researchers, building capacity of all participants.
- **Creation of and access to data:** Datasets that are well-structured and accessible will have ongoing value. Where mandates or jurisdictions are unclear and there is a limited history of data curation and sharing, a trusted relationship between parties needs to be developed in order to overcome such procedural and institutional challenges. A trusted third party can play an important role in these situations.
- **Scenario planning:** Scenario planning provides a structured and powerful tool to think about the future and challenges, especially where there are large uncertainties such as changes to natural systems (e.g. water and climate), changes in rules or an adjustment of goals (e.g. livelihood goals); and can be based on existing data, modelled, or a combination of both. Scenarios work best when elicited from in-country partners or developed in conjunction with in-country partners rather than imposed.
- **Systems thinking and approaches:** Systems approaches to better integrate biophysical with social and economic information are highly valued by project partners, from design through all stages of the project lifecycle to decision making. Systems approaches also promote participation from a broader range of stakeholders. In general most local research teams had limited experience of these approaches, including scenario planning, and Alliance activities significantly enhanced their capacity to understand and apply such systems tools.
- **Evaluation methods:** Assessments often take place in complex policy settings and systems where there are multiple actors. Accurately defining, measuring and attributing impacts is vital to describing and communicating the success of investments. The use of mixed methods approaches, and better understanding of which approaches work best under certain conditions, will improve the quality of impact evaluation studies and the articulation of impact. Also, the timely return of results to project research teams and partners is important to maintain the salience of results.

Steps required to maintain the Impact Pathway

The results presented from this research are only the first step in developing a greater understanding of the challenges facing decision makers in the management of water resources in the Mekong. Further capacity building and research will add significant value to networking and coordination efforts across the region. Specific activities could include:

- Run the participatory learning process (CHARL) at watershed level and possibly local levels to complement the Delta wide process. This would capture diversity and drive coordination across the provinces; and would also strengthen capacity in scenario planning for the in-country research partners and other proponents of the process.
- Develop demonstration projects tied to local development plans and linked with other local agencies, which would provide a pathway to implementation in real situations to influence local plans and development.
- Run a CHARL process with development banks and other key donors to facilitate synergies and cross learning, which would provide a useful sounding board to support strategic investment for a region that is home to a congested donor funding sphere.



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FOR FURTHER INFORMATION

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